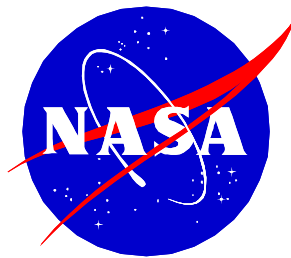


**NASA  
Western Aeronautical Test Range  
(WATR)**

**Services Catalog**



**December 3, 2003**



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## **Preface**

Welcome to the NASA Dryden Flight Research Center (DFRC) Western Aeronautical Test Range (WATR) Services Catalog. In this catalog you will find the services offered by the WATR, a statement of capability, and the cost associated with resource utilization.

This catalog is designed to help WATR customers understand what resources are available, how they are used, and how to estimate the cost of using each resource for a typical mission scenario. Each mission is unique and, as such, may have different pre-mission and post-mission requirements, so the actual cost for each mission may vary.

The catalog is divided into the following range elements: Radar Tracking, Telemetry (TM) Tracking, Radio Frequency (RF) Communications, Flight Termination System (FTS), Video Tracking and Recording, Mission Control Center (MCC), Real-Time Data Processing, Mobile Tracking Systems, and Post-Flight Data Processing.

Each resource or service that the WATR provides to its users is assigned a Product Identification Number (PIN) to facilitate the identification, costing, and tracking of the various resources used by each customer.

## A Note From The Editor

Every effort has been put into this catalog to make it simple and easy to understand. PIN descriptions and examples are provided to help you determine what services you need and how they may be used in typical range support scenarios. However, there are unique situations that may arise which require more information from a knowledgeable range representative. You are encouraged to contact the WATR Business Manager (661-276-2580), the Chief of the Range Operations Branch (661-276-3231), or the Chief of the Range Engineering Branch (661-276-2431) to help you in deciding which range resources are right for you. To obtain a detailed cost estimate for WATR support, please contact the WATR Business Manager at 661-276-2580. WATR information is also available at NASA DFRC website <http://www.dfrc.nasa.gov/Research/Facilities/WATR>.



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## Product Identification Number (PIN)

The following section describes the general capabilities of the WATR and a description of each of the products a customer can request. For ease of use, this section is organized by major functional areas. In general, each range system and subsystem is assigned a PIN. Included with the PIN for each major system is the minimum capability of that system. The customer can add additional capabilities (PINs) to meet their specific requirements. Each PIN covers all support requirements for the requested service, to include operations and maintenance labor, and delivery of the data to the customer. All off-site distribution of data that requires the use of commercial circuits will be charged the additional cost of those circuits.

In most cases, the customer will be charged for set-up and tear down of the system as well as for the duration of the mission. The mission begins with the first pre-mission check of the test article that utilizes a particular WATR resource.

Distribution of audio and video data is a part of the RF communications and video tracking capabilities. Audio distribution provides for the reception and/or transmission of air-to-ground and network communication systems. Video distribution includes the reception, recording, and distribution of any video data routed to the Video Control Center. Audio and video distribution service is included in all applicable PINs. There is no separate charge for this service.

## **Radar Tracking**

The WATR operates and maintains two precision Range Instrumentation Radar (RIR) tracking systems. Each radar has a 1-megawatt transmitter and is designed to track objects both in the atmosphere and in low earth orbits. The radars are classified as high-accuracy instrumentation systems with least-significant-bit (LSB) precision of  $0.00068^\circ$  in angle and 0.5 International Yards in range. Specific tracking accuracy is dependent on the type of track and by the level of systematic, atmospheric, or target-induced random errors. The radar site also has the capability to simultaneously accept up to eight streams of acquisition data in different formats and to format the radar data to suit the customer's requirements.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
RT00	Radar Tracking  and	This PIN includes all of the materials and labor to provide radar tracking of any aircraft or space vehicle and to distribute record the data. This also includes the use of the Data Enhancement System (DES) to reformat both incoming data streams and output formats.  Estimate 1 unit per mission hour plus 1.5 units for set-up/tear down of the system.

## Telemetry Tracking

The WATR operates and maintains three telemetry tracking antennas that operate in the C-, L-, and S-band frequencies, and can provide tracking coverage from horizon to horizon. Multiple downlinked telemetry and video frequencies as well as an uplinked frequency can be supported from a single antenna. The customer will be assigned the use of the antenna that best fits their requirements.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
TT00	Telemetry Tracking	<p>This PIN provides the support required to acquire telemetry data from an aircraft or space vehicle and distribute it to the customer. One high gain antenna provides one uplinked frequency, four downlinked telemetry frequencies, and two downlinked video frequencies.</p> <p>Estimate 1 unit per mission hour plus 1.5 units for set-up/tear down of the system.</p>

## RF Communications

The WATR operates and maintains a variety of Ultra High Frequency (UHF), Very High Frequency (VHF), and High Frequency (HF) air-to-ground communications systems. Antenna systems include omni-directional, high-gain directional parabolic arrays, and both dual and quad yagi arrays. The customer will be assigned the use of the antenna that best fits their requirements.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
RF00	RF Communications	<p>This PIN provides air-to-ground communications support between the mission control center (or the customer's control room) and the test aircraft or space vehicle. Multiple frequencies will be supported with the appropriate antennae.</p> <p>Estimate 1 unit per mission hour plus 1 unit for set-up/tear down of the system.</p>

## Flight Termination System

The WATR operates and maintains a Flight Termination System that meets the Range Commanders Council standards for this type of equipment. Remote control of the system is available from any WATR control room. The customer will be assigned the use of an

omni-directional antenna unless the requirements dictate the use of a high-gain parabolic array antenna.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
FT00	Flight Termination System	<p>This PIN provides for all of the materials and labor to operate an FTS System and to interface to the user.</p> <p>Estimate 1 unit per mission hour plus 2 units for set-up/tear down of the system.</p>

## **Video Tracking**

The WATR Video Control Center (VCC) has the capability to distribute and record video for multiple missions simultaneously. As previously mentioned, distribution of the video sources is not charged separately. This PIN covers the use of a variety of cameras, including two Long Range Optical (LRO) tracking systems and broadcast-quality, high-definition cameras as well as infrared cameras are available to include coverage of the ramp areas and the main Edwards AFB runway. Video is automatically recorded on Beta Superior Performance (SP) and stored at no charge for 30 days. Video can be recorded during the mission on a variety of other formats including Video Home System (VHS), Digital Video Disc (DVD), D2 digital composite (slow motion), and High Definition. If additional copies of recordings are required after the mission, contact the Public Affairs, Commercialization, and Education (PACE) Office at (661) 276-3449.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
RV00	Video Tracking	<p>This PIN provides use of the Video Control Center for the operation of ramp cameras and long range optical tracking systems. Distribution and recording of video sources are also included in this service.</p> <p>Estimate 1 unit per mission hour plus 1 unit for set-up/tear down of the VCC.</p>
TV00	Video Van Tracking	<p>This PIN is used when a customer requires mobile video tracking support. The vans are available to cover remote testing areas with</p> <p>real-time video provided to the control room via a microwave link.</p> <p>Estimate 1 unit per mission hour plus 1 unit for set-up/tear down of the system.</p>

RV07	Beta SP Recordings	Cost of Beta video tapes used during real-time recording and provided to the customer. Also, if stored longer than the normal 30-day retention period, the customer will be charged for the cost of the tapes.
RV09	VHS Recordings	Cost of VHS video tapes used during real-time recording.
RV11	DVD Recordings	Cost of DVD video tapes used during real-time recording.

## **Mission Control Center**

The WATR operates and maintains two large control rooms that can be configured to meet specific customer requirements. The customer can request one room or a combination of rooms to meet their needs. Numerous workstations, strip-chart recorders, and other display devices are provided along with audio communications and video displays. In addition, WATR personnel utilize control rooms and real-time data processing systems to verify and validate the development of customer displays.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
MC00	Mission Control Center (MCC)	<p>This PIN is used when the customer requests the use of an MCC for data display and analysis and/or mission safety monitoring. The customer will get the full use of the Mission Control Center capabilities, to include telemetry data displays, radar data (GRIM and/or TECCS), air-to-ground RF communications, video displays, Flight Termination System, etc.</p> <p>Estimate 1 unit per mission hour plus 1 unit for set-up/teardown of the MCC.</p>
SD00	Project Software Development	<p>This PIN is used when a customer is processing and displaying telemetry data in one of the WATR control rooms. An estimate will be made to determine how much software display development is required based on the customer's data display requirements.</p> <p>Estimate 1 unit per labor hour.</p>

## **Real-Time Data Processing**

The WATR operates and maintains two Telemetry and Radar Acquisition Processing Systems (TRAPS) that are used to acquire and process both incoming radar and telemetry data. All pre-processing of the data is accomplished by applying the appropriate calibrations. Both radar and telemetry data are handled as a data stream. Each system can support up to six data streams. The data can then be routed to any one or a combination of control rooms. The data can also be formatted to send off site to a customer's facility. Both real-time data and data played back from an on-board data tape can be supported. Raw data is automatically processed and archived based on customer requirements.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
DP00	Real-Time Data Processing	This PIN provides the support required to process telemetry and/or radar data from an aircraft or spacecraft and distribute it to one of Dryden's MCCs or to an off-site location.  Estimate 1 unit per mission hour plus 1 unit for set-up/tear down of the system.

## **Mobile Tracking Systems**

The WATR operates and maintains several mobile range instrumentation systems that are used to provide communications, tracking, and data acquisition to various research aircraft and to process and display the data. The data can also be reformatted and transmitted to a customer's facility. Remotely piloted, command uplink, and Flight Termination Systems are also available.

If a mobile system is deployed to a remote area, and cannot be used by other projects, the customer will be charged for the entire time the system is deployed using a normal work day as a basis.

<b><u>PIN</u></b>	<b><u>PIN Title</u></b>	<b><u>Description</u></b>
MS00	Mobile Systems	This PIN is used when a customer has requirements for a mobile telemetry tracking system providing telemetry acquisition, processing, and display capabilities. The system has communication capability with the aircraft as well as remote network connectivity. This PIN provides all of the materials and labor to operate the system and to distribute and record the data.  Estimate 1 unit per mission hour plus 2 units for set-up/tear down of the system.

## Post-Flight Data Processing

After the mission is completed the customer can elect to have their data archived in the Data Analysis Facility where it can be further processed and reformatted to suit their needs. The customer will also have access to their data via the internet using one of several software applications. Post-flight processing is provided for data recorded during the mission and for tapes recorded onboard mission aircraft.

<u>PIN</u>	<u>PIN Title</u>	<u>Description</u>
PF00	Post-Flight Data Processing	<p>This PIN is used when the customer requests data to be post-flight processed and made available to the customer.</p> <p>The estimated number of units for this PIN are automatically calculated based on length of mission and the combined bit rate of all the data.</p>

## FY04 PIN Rates

PIN #	Title	RATE
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RT00	Radar Tracking	\$799.59
TT00	Telemetry Tracking	801.91
RF00	RF Communications	169.96
FT00	Flight Termination System	327.05
RV00	Video Tracking	266.72
TV00	TV Van Video Coverage	712.96
RV07	Beta SP Recording	23.55
RV09	VHS Recordings	1.52
RV11	DVD Recordings	5.00
MC00	Mission Control Center	1624.85
SD00	Project Software Development	114.34
DP00	Real-Time Data Processing	1485.23
MS00	Mobile Tracking Systems	577.53
PF00	Post-Flight Data Processing	507.22

## Mission Scenario

**Mission Control Center with Real-Time Data Processing:** This mission scenario requires mission control room support with real-time telemetry and radar data displays, RF communications, and video monitors. In addition, the TV Van is utilized for takeoff and landing coverage. Post-flight data and video recordings are also provided. The mission duration includes one hour of control room staffing for ground checks prior to

flight and two hours of flight time. This scenario does not include software development and display verification prior to the mission.

<b>PIN #</b>	<b>Title</b>	<b>Rate</b>	<b>Unit</b>	<b>Setup/ Teardown</b>	<b>Mission Duration</b>	<b>Total</b>
RT00	Radar Tracking	799.55	1	1.5 hours	3 hours	3,598.16
TT00	Telemetry Tracking	801.91	1	1.5 hours	3 hours	3,608.60
RF00	RF Communications	169.96	1	1 hour	3 hours	649.84
RV00	Video Tracking	266.72	1	1 hour	3 hours	1,066.88
TV00	TV Van Video Coverage	712.96	1	1 hour	3 hours	2,851.84
RV07	Beta SP Recording	23.55	1	.5 hour	3 hours	35.33
RV11	DVD Recording	5	1	.5 hour	3 hours	7.50
MC00	Mission Control Center	1624.85	1	1 hour	3 hours	6,499.40
DP00	Real-Time Data Processing	1485.23	1	1 hour	3 hours	5,940.92
PF00	Post-Flight Data Processing	507.22	1	1 hour	3 hours	1,521.66
<b>Total Mission Cost</b>						<b>\$25,780.13</b>

## Mission Scenario

**Mission Control Center with Flight Termination System:** This mission scenario is normally used to support Unmanned Aerial Vehicles (UAVs). It requires mission control room support with real-time telemetry and radar data displays, RF communications, Flight Termination System, and video monitors. It also requires Mobile tracking system support. Video recordings are provided at the end of the mission. The mission duration includes one hour of control room staffing for ground checks prior to flight and two hours

of flight time. This scenario does not include software development and display verification prior to the mission, or any post-flight data.

<b>PIN #</b>	<b>Title</b>	<b>Rate</b>	<b>Unit</b>	<b>Setup/ Teardown</b>	<b>Mission Duration</b>	<b>Total</b>
RT00	Radar Tracking	799.55	1	1.5 hours	3 hours	3,598.16
TT00	Telemetry Tracking	801.91	1	1.5 hours	3 hours	3,608.60
RF00	RF Communications	169.96	1	1 hour	3 hours	679.84
FT00	Flight Termination System	327.05	1	2 hours	3 hours	1,635.25
RV00	Video Tracking	266.72	1	1 hour	3 hours	1,066.88
RV07	Beta SP Recording	23.55	1	.5 hour	3 hours	35.33
RV11	DVD Recording	5	1	.5 hour	3 hours	7.50
MC00	Mission Control Center	1624.85	1	1 hour	3 hours	6,499.40
DP00	Real-Time Data Processing	1485.23	1	1 hour	3 hours	5,940.92
MS00	Mobile Tracking System	577.53	1	2 hours	3 hours	2,887.65
<b>Total Mission Cost</b>						<b>\$25,959.53</b>

## **Cancellation Charges**

A customer will not be charged for the scheduled use of range assets as long as the mission was canceled prior to 1500 hours (3 pm) the business day before the scheduled time slot. If the customer cancels the mission after 1500 hours for any reason, the charge will be two hours or the actual time the range assets are used, whichever is greater. If the

range assets are rescheduled to support another mission during the same scheduled time slot, the canceling customer will not be charged. Cancellations due to range failures will not result in a charge to the customer and will be given priority when rescheduling the mission.

## **Abbreviations**

AFB	Air Force Base
DAF	Data Analysis Facility
DES	Data Enhancement System
DFRC	Dryden Flight Research Center
DVD	Digital Video Disc

FTS	Flight Termination System
GRIM	Global Real-time Interactive Map
HF	High Frequency
LRO	Long Range Optics
MCC	Mission Control Center
MOF	Mobile Operations Facility
PACE	Public Affairs, Commercialization, and Education
PIN	Product Identification Number
RCO	Range Control Officer
RF	Radio Frequency
RIR	Range Instrumentation Radar
SP	Superior Performance
TECCS	Test & Evaluation Command and Control System
TIE	Test Instrumentation Engineer
TM	Telemetry
TRAPS	Telemetry and Radar Acquisition Processing System
UAV	Unmanned Aerial Vehicle
UHF	Ultra High Frequency
VCC	Video Control Center
VHF	Very High Frequency
VHS	Video Home System
WATR	Western Aeronautical Test Range